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Original Article

INTELLIGENT FACIAL RECOGNITION AND RETRIEVAL FROM FACIAL IMAGE DATABASES

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ABSTRACT

In Digital Image research is intended to develop an intelligent retrieval algorithm for image databases in facial. Intelligent retrieval algorithm has been designed to retrieve the appropriate face from facial image databases when an input facial image is provided for automatically identifying or verifying a person from the digital image or a video frame from a video source. Knowledge of the collections usually rests with the librarians, archivists, curators or others responsible for its upkeep and less often the actual users. A decision has to be made on the manual data about the associated metadata and often may not be feasible, due to lack of resources, to upgrade the content of the catalog or textual record associated with the image.

KEYWORDS: Facial Image, Color, Texture & Shape

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INTRODUCTION

Positive identification of individuals is a very basic societal requirement. In today's larger, more complex society, identification of individuals is not that simple. In fact, as more interactions take place electronically, it becomes even more important to have an electronic verification of a person's identity. Until recently, electronic verification took one of two forms. It was based on something the person had in their possession, like a magnetic swipe card, or something they knew, like a password. The problem is, these forms of electronic identification aren't very secure, because they can be given away, taken away, or lost and motivated people have found ways to forge or circumvent these credentials. The ultimate form of electronic -verification of a person's identity is biometrics; using a physical attribute of the person to make a positive identification.

FACE CONTOUR EXTRACTION

Facial Contour extraction module consists of two steps: Initially, it separates the skin range of facial regions and marks it with rectangles. As a second step, it takes the exact contour of the face from the rectangle region bounded.

Face Region Marking with Rectangles

Face regions in the images are marked with rectangles with a series of steps as shown in figure 1

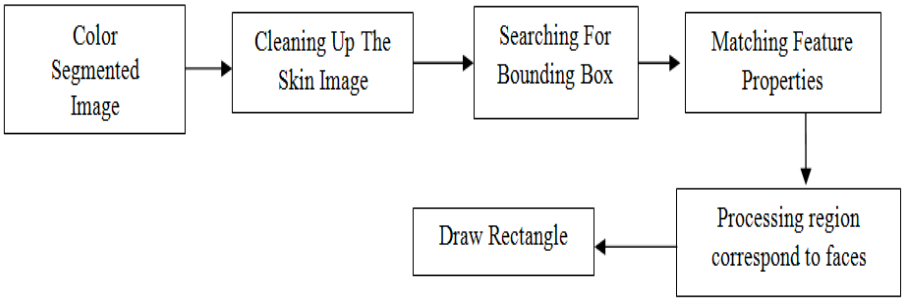

Figure 1: Marking Face Regions with Rectangle

Cleaning up of Skin Regions

This module focuses on identifying the face region from the skin regions reported by the Color Segmentation module. An intermediate output from color segmentation has region other than faces that fall under skin color range also. Therefore this module removes the regions other than the face that falls under the skin color range by reducing the noise in those images.

Marking of Rectangles

The regions are labeled and the properties of each labeled region are measured using the Bounding Box property. The rectangular box property like height, width etc are calculated using predefined values and regions measured properties. The final step is to process each face region and draw a rectangle around the face.

The above steps have also been explained with the algorithm 1.

Algorithm 1: Marking the Face Image with the Rectangle Box

- Clean up the skin image.
- Search for all bounding box
- Process regions corresponding to face.
- Draw rectangle.

Algorithm 1.1: Clean Up the Skin Image

This module reads the segmented image and processes it to remove the non-skin regions

- **Input:** segmented image
- **Output:** Noise regions removed an image
- **Algorithm:**

Store the pre-defined maximum and minimum values for face height and width.

Begin

Read the segmented image

Label every region in the image.

For each region in the image

Compute the size of region

If(size(reg)<noise_face_max) then

Remove the region.

End

End

Return the noise removed image.

End

Algorithm 1.2: Search for All Bounding Boxes

This module focus on measuring the bounding box property of each region.

- **Input:** Cleaned image
- **Output:** Structured array with measurements for each region
- **Algorithm:**

Begin

Label all the regions

For each region in the image Do

Measure the region with a Bounding Box property.

Allocate structure for storing all measured properties

End

Return the array

End

Algorithm 1.3 Process Regions Corresponding to the Face

This procedure is to process each possible region in the image and measure the appropriate height and width for detected rectangle regions.

- **Input:** Structured array with measurements for each region
- **Output:** Rectangle co-ordinates
- **Algorithm:**

Begin

For each possible face region in the image do

Retrieve the bounding box property for the region

Retrieve rectangular coordinates and rectangular height and width.

Calculate the appropriate face height.

Calculate the appropriate face width.

Store calculated values in the structure.

Return rectangle coordinates

End

Algorithm 1.4 Draw a Rectangle

This procedure is to draw a rectangle around the face region using the stored values.

- **Input:** Rectangle coordinates**.**
- **Output:** Image with a rectangle drawn around the face region.
- **Algorithm:**

Begin

Retrieve the stored co-ordinates values.

Draw the rectangle using the built function.

End

Threshold

This paper uses a value which is a little higher than the global minimum as the threshold to locate the position of the mouth, which for example could look like the image bottom left.

CONCLUSION AND FUTURE SCOPE OF WORK

This work develops an automated system for face detection and retrieval with sample videos. The detection rate of the proposed system is around 90% and the false detection rate is about 5%. This system detects Indian faces, even in poor lighting conditions with an unconstrained background but the limitation is that it cannot recognize the faces wearing specs.

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